Tevatron collider progress: July to September 2002

I. Luminosity: → early July (5 stores #1494-1518)
Average initial peak L=18.6
→ early Sept (5 stores #1735-1750)
Average initial peak L=22.1
or 19% increase =
+mostly due to smaller pbar emittance
(N_p –6%, N_pbar=+8%, ε_eff –17%)

Consistently over Run I record luminosity(24.1e30 @ CDF): store #1583 with 26.4e30 average (28.1 @ CDF)

Luminosity lifetime is about the same (10 hrs) as in July, N_p lifetime is down 26 hr vs 170 hr in July → noticeable p-losses , τ_pbar is up 46 hr vs 24 hr (not clear why)

II. Reliability:→ about 50% of 40 stores ended improperly
(abort kickers, VFC cards, RF trips, raccoons…)

→ TEL acted flaky over last weeks

→ transv-blowups are not under control yet

→ >3 weeks spent to get reliable closure

III. Technical progress:

→ long.damper fixed σ_S blow ups (Tan/JS)

→ BLT shows signs of life (DM, VSc, JA)

→ pbar inj "bumper" adjusted (BH/DB)

→ SLite in much better shape (HCh/SP)

→ Tev ArrayViewer (RM)

→ regular orbit smoothing helps ! (MM)

→ C_h,v technique re-born (FDj/DS)

→ Transverse damper installed, needs time

Technical issues for next 2 months :

- → perfect BLT operation
- → fix “jumping FW” emittances
- → Slite pbar size/tilt “puzzle”
- → New BPMs decision
- → Head-tail monitor
- → New Schottky at E17 (Jan 03)
- → SBD –no gaps in σ_S on ramp
- → FBI – pbar channel relaibrate(?)
- → Q/coupling drift compensation (MM+)
- → Operational orbit smoothing (JA, MM+)
- → Injection dampers (JS/Tan) – after tbbd, expect in 2003.
- → C0 magnet replacement (Jan’03)
- → HF orbit motion detector (XLZ)

IV. Progress in Physics/Understanding:

- → Tune coupling drift studied (MM+)
- → Dancing bunches model (V.Balbekov)
- → Local IR decoupling (TS, BE, MX, FS+)
- → A0 lattice modification (AX, VL)
- → Larger helix at 980 (TS)
- → TEL losses/NL effects (VS,XLZ,KB)
- → Some progress in loss calibration (AT+)
- → SDA: $d\sigma_S$ /dt, Lumi analysis (PL,JS)

Less progress, Issues, Studies needed:

- → A1/P1 line optics (VL, AX, +MI guys)
- → P,Pbar loss on ramp 12% as before (FS, VS)
- → Pbar loss early in squeeze still 4-6% (YA+)
- → Beam-beam at 150 (YA, TS, BE, +)
- → Beam-beam at 980, WPs, Q's, etc (TS, BE,+)
- → transverse instability 150→980 (PI, YA, Tan)
- → collimation system (N.Mokhov+, DS, RM)

V. General comments+shutdown:

I am very pleased to see Tanaji Sen, Bela Erdelyi, Valery Balbekov, Mike Syphers, Aimin Xiao, Peter Ivanov and visitors (Wolfram Fischer, Frank Schmidt) becoming very effective in running/studying the Tevatron. We rely on you now and praise your commitment. Due to management ineffectiveness (including mine) the process of "beefing up" the Tevatron program took that long, till the period of reduced study time. Special thanks to D.McGinnis, S.Pordes, V.Scarpine, E.Lorman, F.DeJongh for recent contributions.

Reduced time for studies:

a) be better prepared, write all details down (e.g., p- ,pbar-only stors)

b) we will make the case of the effect of limited study time before lab management as it greatly reduced luminosity progress (3 shifts/wk?)

Major projects for Jan'03 shutdown:

- C0 Lambertson replacement (P.Garbincius)
- New Schottky detectors (DB, BH)
- Vacuum improvement (BH)
- TEL modification (VS)
- A0 lattice modification (AX, YA, VL, JA, TS, VS)

V. Expectations

(last time it was "**Peak luminosity of 2.6-3.0e31 early September" we have 2.61…)**:

pbar emittance improved (<16pi at 150/LB?) in 2 mos

(BLT, A1 line)

→ some 10+10 in N_pbar=20 % luminosity increase

more protons to LB (>200e9?) in 2 month

(dampers, octupoles, TEL)

→ some 10% luminosity increase

progress with MI in 2 mos

(smaller p/pbar longitudinal emittance)

→ some 5% improvement in luminosity

…**as the result →**

N_pbar increased to >600e9 at LB

N_p increased to 7200e9 at LB

Smaller emittances

→ some 20-40% improvement in luminosity in November

Peak luminosity of 3.2-4.0e31 early November